UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/725,433	12/03/2003	Heung-Yeop Jang	Q77246	5326

23373   7590   03/03/2008

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ART UNIT	PAPER NUMBER
2626	

MAIL DATE	DELIVERY MODE
03/03/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>03 December 2003</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☒ Some * c)☐ None of:

        1.☒ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>07/11/2005</u>.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set

forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this

application is eligible for continued examination under 37 CFR 1.114, and the fee set

forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action

has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on

12/26/2007 has been entered.

Claim Rejections - 35 USC § 103

2.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

3.   Claim 1, 2, 5-7, and 10-13 rejected under 35 U.S.C. 103(a) as being

unpatentable over Arean et al US 6253185 B1 (hereinafter Arean) in view of Akagiri US

5490130 A (hereinafter Akagiri).

    Re claims 1 and 6, Arean teaches an audio data encoding apparatus comprising:

    a time-to-frequency converting unit that receives a time domain audio signal and

converts the time domain audio signal to a frequency domain audio signal (Col. 11 line

59-61 and Fig. 8);

a spectral processor that receives the frequency domain audio signal and performs spectral processing on the frequency domain audio signal according to an audio encoding format (Col. 17 line 45-59);

a masking threshold calculator that receives the frequency domain audio signal (Col. 12 line 4-7), calculates an energy level for each frequency band of the frequency domain audio signal, approximates an energy distribution curve (Col. 2 line 13-33 & fig. 11-12) to a distribution pattern of noise threshold levels calculated by a psychoacoustic model (Col. 11 line 28 – Col. 12 line 18 & Fig. 6A-6B), the energy distribution curve connecting the calculated energy levels, and calculates a scale factor band gain for each frequency band (Col. 12 line 9-14);

a quantization noise curve adjuster (Col. 2 lines 13-45) that adjusts a common gain to meet a target bit rate (Col. 12 line 19-33) and matches a quantization noise curve to the approximated energy distribution curve while fixing the scale factor band gain for each frequency band (Col. 12 line 9-14)

wherein the masking threshold calculator comprises:

an energy distribution curve calculator that performs Modified Discrete Cosine Transform (MDCT) on the frequency domain audio signal to calculate the energy level for each frequency band (Col. 12 line 9-14)

a quantization noise curve pattern estimator that adjusts quantization noise distribution (Col 14 lines 13-35) by relatively adjusting a gain for each frequency band based on the calculated energy distribution curve in order to approximate the energy distribution curve to the distribution pattern of noise threshold levels (Col. 12 line 18-34);

a bit adjustment initial value setter that determines the scale factor band gain in

such a way as to use more bits than the target bit rate (Col. 12 line 18-34).

However, Arean fails to particularly teach energy levels individual frequency band

with different levels (Akagiri Col. 18 lines 46-66 & Fig. 6-8).

Akagiri teaches an allowable noise level calculating circuit 20 also calculates the

difference between the energy or peak signal amplitude in each band and the allowable

noise level in each band and feeds this information to the adaptive bit allocation and

quantizing circuit 18. From this information, the adaptive bit allocation and quantizing

circuit 18 determines the number of bits to allocate to each band for quantizing the

spectral coefficients in the band, and re-quantizes the spectral coefficients in each band

using to the number of bits allocated to the band. The spectral coefficients, re-

quantized as just described, are supplied to the multiplexer 51 as the main information

of the compressed signal fed from the multiplexer to the output terminal 19.

Additionally, Akagiri teaches the band energy calculating circuit determines the

energy in each critical band by calculating the sum of the amplitudes of the spectral

coefficients in the band. The band energies can also be calculated by a root-mean-

square calculation using the spectral coefficients. The peak or mean values of the

amplitudes of the spectral coefficients may be used instead. The output of the band

energy calculating circuit 22 is a spectrum of the energy in each critical band, and is

called a bark spectrum. FIG. 7 shows such a bark spectrum SB of the energies in

twelve successive critical bands. To take account of the effect of the bark spectrum SB

on masking, convolution processing is carried out in which the bark spectrum is multiplied by predetermined weighting coefficients and the resulting products are summed. The convolution processing calculates the sum of the effects of the energies in the neighboring critical bands on the masking level in each critical band. These are indicated by the broken lines in FIG. 7 (Akagiri Col. 19 lines 1-25).

Akagiri also teaches allowable noise correction circuit 30 and the output terminal 31 to the adaptive bit allocation and quantizing circuit 18, which includes the ROM 50, in which, e.g., plural pre-allocated bit allocation patterns are stored. In response to the difference between the energy in each band and the allowed noise level for each band obtained via the allowed noise correction circuit 30 from the subtractor 28 in the allowed noise level calculating circuit, the ROM 50 selects one of the pre-allocated bit allocation patterns and reads out an allocated bit number for each band. The adaptive bit allocation and quantizing circuit then requantizes the spectral coefficients (Akagiri Col. 20 lines 13-26).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention calculating energy levels for each frequency band, where an energy distribution can be approximated to noise thresholds. Using individual frequency bands allows for the proper noise threshold applied between the energy levels in a signal, where masking can be implemented, bits allocated, and bit allocation patterns stored. Additionally, the use of individual frequency bands allows for a requantization of spectral coefficients in each band, where a noise correction can be implemented to find noise present when there is a difference in energy levels in neighboring bands.

Re claim 2, Arean teaches a time-to-frequency converting unit performs Modified

Discrete Cosine Transform (MDCT) on the input time domain signal (Arean Col. 11 line

61-65).

Re claim 5, Arean fails to teach a quantization noise curve adjuster compares the

number of bits available for a given bit rate with the number of bits used, and if the

number of bits used is smaller than the number of bits available, performs encoding

using the number of bits available, or, if the number of bits used is not smaller than the

number of bits available (Akagiri Col. 21 lines 20-38), repeats matching of the

quantization noise curve.

Akagiri teaches a correction information output circuit 33 that may be used to

correct the allowable noise level in response to information indicating the difference

between the number of bits used by the adaptive bit allocation and quantizing circuit 18

(FIG. 4) for quantizing the spectral coefficients, and the target bit rate of the

compressed signal. This correction is required because an error may exist between the

total number of bits allocated in an advance bit allocation by the adaptive bit allocation

and quantizing circuit 18 and the number of bits corresponding to the target bit rate of

the compressed signal. Therefore, the bit allocation must be repeated to reduce the

error to zero. The second bit allocation is carried out such that, when the total number

of allocated bits is less than the target value, a number of bits equal to the difference is

distributed among the bands to add to the bits already allocated. On the other hand,

when the total number of allocated bits is greater than the target value, a number of bits

equal to the difference is distributed among the bands for removal from the bits already

allocated.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time of the invention a bit availability comparison scheme to allow for encoding available

bits. Bit allocation allows for the reduction of error, where a compressed signal relative

to a target value can be maintained to be greater than the allocated bits. Additionally,

using a bit allocation amount relative to a target value would ensure proper compression

without losing data.

Re claims 7 and 10-13, Arean teaches an audio data encoding method

comprising:

(a) receiving a time domain audio signal and converting the time domain audio

signal to a frequency domain signal (Col. 17 line 45-59);

(b) performing spectral processing on the frequency domain signal according to

an audio encoding format (Col. 11 line 59-61 and Fig. 8);

(c) receiving the frequency domain signal, calculating an energy level for each

frequency band of the frequency domain signal (Col. 12 line 4-7), approximating an

energy distribution curve (Col. 2 line 13-33 & fig. 11-12) to a distribution pattern of noise

threshold levels calculated by a psychoacoustic model (Col. 11 line 28 – Col. 12 line 18

& Fig. 6A-6B), the energy distribution curve connecting the calculated energy levels,

and calculating a scalefactor band gain for each frequency band (Col. 12 line 9-14);

(d) adjusting a common gain (Col. 2 lines 13-45) to meet a target bit rate (Col. 12 line 19-33) and matching a quantization noise curve to the approximated energy distribution curve while fixing the scalefactor band gain for each frequency band (Col. 12 line 9-14)

wherein (c) comprises:

(cl) calculating the energy level for each frequency band with the frequency domain (Col. 12 line 9-14)

(c2) approximating the energy distribution curve (Col 14 lines 13-35) to the distribution pattern of noise threshold levels by approximating the energy level for each frequency band (Col. 2 line 13-33 & fig. 11-12) and estimating the pattern of a quantization noise distribution curve using a distribution pattern of the approximated energy levels (Col. 12 line 18-34);

(c3) determining an initial value for bit adjustment in order to match the quantization noise distribution curve to the energy level for each frequency band (Col. 2 line 13-33 & fig. 11-12) according to a target bit rate and calculating a scalefactor band gain for each frequency band (Col. 12 line 18-34),

However, Arean fails to teach wherein in (c2), if a signal in one of adjacent frequency bands has an energy level greater than that of a signal in a particular frequency band (Akagiri Col. 18 lines 46-66 & Fig. 6-8), the energy level of the signal in the particular band is increased by a predetermined ratio (Akagiri Col. 19 lines 1-25)

with respect to a difference with the greater energy level in the adjacent frequency band (Akagiri Col. 18 lines 46-66 & Fig. 6-8).

Akagiri teaches an allowable noise level calculating circuit 20 also calculates the difference between the energy or peak signal amplitude in each band and the allowable noise level in each band and feeds this information to the adaptive bit allocation and quantizing circuit 18. From this information, the adaptive bit allocation and quantizing circuit 18 determines the number of bits to allocate to each band for quantizing the spectral coefficients in the band, and re-quantizes the spectral coefficients in each band using to the number of bits allocated to the band. The spectral coefficients, re-quantized as just described, are supplied to the multiplexer 51 as the main information of the compressed signal fed from the multiplexer to the output terminal 19.

Additionally, Akagiri teaches the band energy calculating circuit determines the energy in each critical band by calculating the sum of the amplitudes of the spectral coefficients in the band. The band energies can also be calculated by a root-mean-square calculation using the spectral coefficients. The peak or mean values of the amplitudes of the spectral coefficients may be used instead. The output of the band energy calculating circuit 22 is a spectrum of the energy in each critical band, and is called a bark spectrum. FIG. 7 shows such a bark spectrum SB of the energies in twelve successive critical bands. To take account of the effect of the bark spectrum SB on masking, convolution processing is carried out in which the bark spectrum is multiplied by predetermined weighting coefficients and the resulting products are summed. The convolution processing calculates the sum of the effects of the energies

in the neighboring critical bands on the masking level in each critical band. These are

indicated by the broken lines in FIG. 7 (Akagiri Col. 19 lines 1-25).

Akagiri also teaches allowable noise correction circuit 30 and the output terminal

31 to the adaptive bit allocation and quantizing circuit 18, which includes the ROM 50, in

which, e.g., plural pre-allocated bit allocation patterns are stored. In response to the

difference between the energy in each band and the allowed noise level for each band

obtained via the allowed noise correction circuit 30 from the subtractor 28 in the allowed

noise level calculating circuit, the ROM 50 selects one of the pre-allocated bit allocation

patterns and reads out an allocated bit number for each band. The adaptive bit

allocation and quantizing circuit then requantizes the spectral coefficients (Akagiri Col.

20 lines 13-26).

Therefore, it would have been obvious to one of ordinary skill in the art at the

time of the invention calculating energy levels for each frequency band of

adjacent/neighboring frequency bands that are compared to one another having a

difference greater than other frequency bands, where a ratio / weighting coefficient is

used to alter the energy level to overcome noise in a signal. Using individual frequency

bands allows for the proper noise threshold applied between the energy levels in a

signal, where masking can be implemented, bits allocated, and bit allocation patterns

stored. Additionally, the use of individual frequency bands allows for a requantization of

spectral coefficients in each band, where a noise correction can be implemented to find

noise present when there is a difference in energy levels in neighboring bands.

4.   **Claim 3 rejected under 35 U.S.C. 103(a) as being unpatentable over Arean et al US 6253185 B1 (hereinafter Arean) in view of Akagiri US 5490130 A (hereinafter Akagiri) and further in view of Araki 6,456,963 (hereinafter Araki).**

Re claim 3, Arean in view of Akagiri fails to the apparatus of claim 1, wherein the spectral processor performs Temporal Noise Shaping (TNS) (Araki col. 2 line 26-35), Long Term Prediction (LTP), or Perceptual Noise Substitution (PNS) according to an audio encoding format.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention using temporal noise shaping to process an audio signal. Using temporal noise shaping allows for linear/adaptive predictive coding to process speech or other audio signals in compressed formal, where thresholds can be implemented for masking purposes to perceptual coding in a reduced quantization environment.

5.   **Claims 14-19 rejected under 35 U.S.C. 103(a) as being unpatentable over Arean et al US 6253185 B1 (hereinafter Arean) in view of Akagiri US 5490130 A (hereinafter Akagiri) and further in view of Hotta US 20020120442 A1 (hereinafter Hotta).**

Re claims 14-19, Arean teaches the apparatus of claim 1, wherein the quantization noise curve pattern estimator (Col 14 lines 13-35) approximates the energy distribution curve (Col. 2 line 13-33 & fig. 11-12) to the distribution pattern of noise threshold levels (Col. 12 line 18-34)

However, Arean in view of Akagiri fails to teach without using the distribution of

noise threshold levels (Hotta [0277] & [0278]) calculated by the psychoacoustic model

(Hotta [0023] & [0287]).

Hotta teaches an audio signal encoding apparatus which is capable of preventing

deterioration in the objective characteristics of a signal to be encoded without using

parameters from a psychoacoustic model generated based on the human auditory

characteristics or by replacing such parameters with those by which the signal can be

effectively quantized in cases where the width of a frequency band in which the

frequency component such as a sine wave of the signal concerned exists is narrow.

Hotta also teaches a masking threshold in the block type determination section

12, and supplies the resultant SMR thus generated to the allowable error amount

calculation section 31. [0278] The allowable error amount calculation section 31 in the

iterative loop processing section 3 carries out multiplication between the MDCT

frequency spectrum and the reciprocal (1/SMR) of SMR so as to calculate an allowable

amount of error. Note that the amount of error as referred to herein represents a

difference between the MDCT frequency spectrum from the MDCT processing section 2

and the dequantized value generated through quantization/dequantization, i.e., a

quantizing error, and as long as this value remains within an allowable range, noise can

not be perceived by the human ear.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time of the invention approximating through quantization noise estimation, energy

distribution to noise threshold levels without the use of a psychoacoustic model

distribution. Mapping noise threshold levels to energy distribution curves without the

use of a psychoacoustic model or the like allows for a reducing processing time and

memory, where alternative parameters can replace the psychoacoustic parameters.

Additionally, signal can be effectively quantized, thereby preventing deterioration in the

objective characteristics of the signal. Additionally, the processing of calculating the

SMR and the processing of calculating the allowable amount of error can be omitted,

thus providing an effect of reducing the amount of processing.

Conclusion

6.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure. US 5241603 A, US 5559900 A, US 5654952 A, US 5778339 A,

US 6104996 A, US 5839110 A, US 4563638 A, US 5956674 A, US 5307405 A, US

20060130637 A1.

        Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Michael C. Colucci whose telephone number is (571)-

270-1847. The examiner can normally be reached on 9:30 am - 6:00 pm, Monday-

Friday.

        If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Richemond Dorvil can be reached on (571)-272-7602. The fax phone

number for the organization where this application or proceeding is assigned is 571-

273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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